2000 Level Modified Flow Project

Motivation for Study

- Pacific Northwest Coordination Agreement requirement
- Required for accurate assessment of Columbia River Treaty Canadian Entitlement
- Establish common hydrologic basis for regulation studies

Study Objectives

- Daily, weekly, semi-monthly, monthly modified flows for 112 sites for 1929-1999 at 2000 level of development

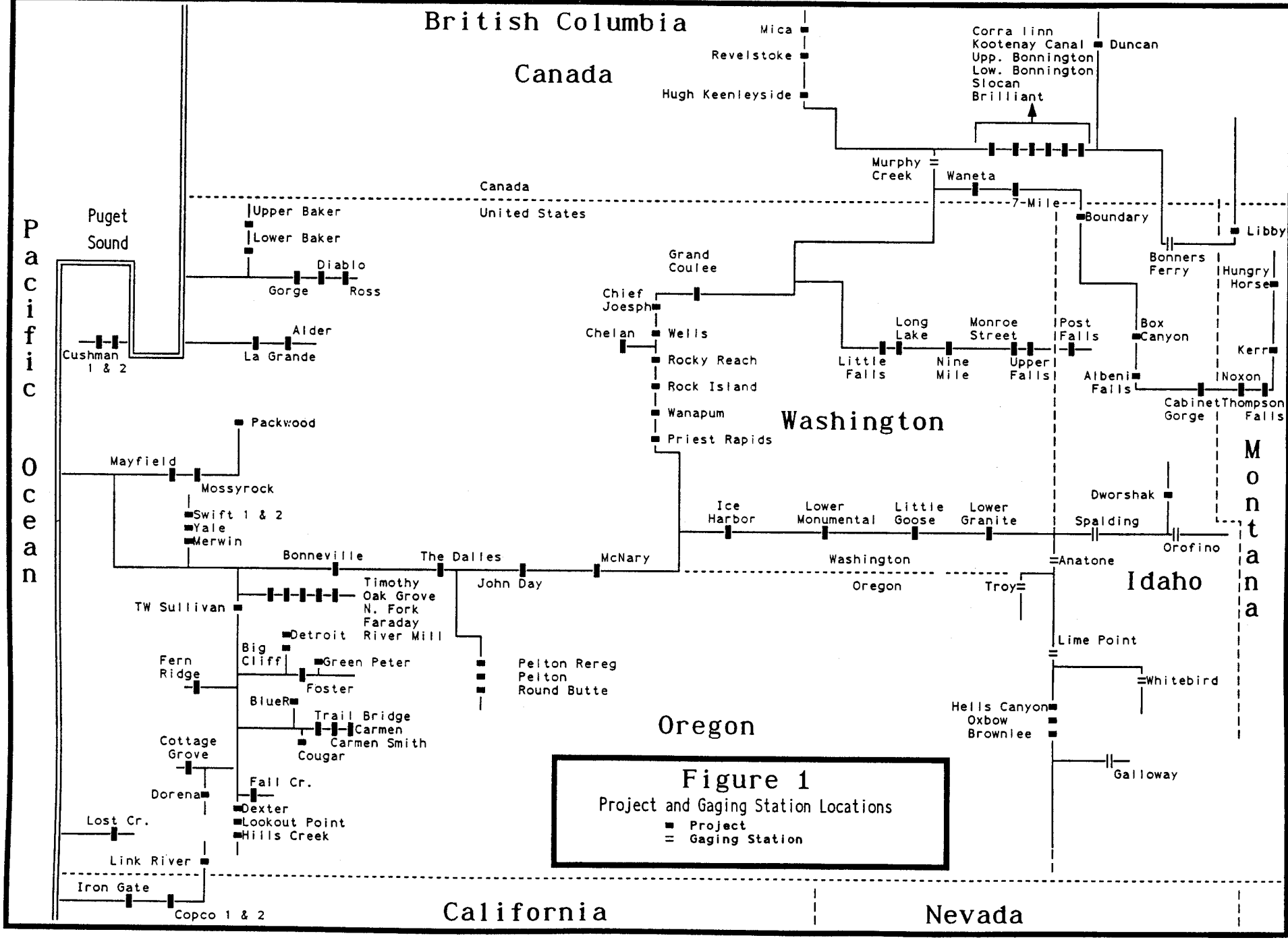


Figure 1

Project and Gaging Station Locations

■ Project

= Gaging Station

Why use modified flows?

- Historical streamflows are inadequate for system regulation studies because the effect of depletions and storage development changes over time.

- Must “unregulate” storage projects and “modify” to a constant level of irrigation development.

What are Modified Flows?

- Historical flows that are adjusted to a common level of irrigation development by correcting for the effects of diversions, return flows, and change of contents and evaporation in upstream reservoirs

History

- 1950’s: mo’ly modified flows for ‘29-’48 for 2 levels of development--1960 and 2010 developed by Columbia Basin Interagency Committee

- Later extended to ‘29-’58

History (cont’d)

- Depletions Task Force of CRWMG developed mo’ly mod flows for ‘29-’68 at 1970 and 2020 levels of development

- Depletions Task Force developed mo’ly mod flows for ‘29-’78 for 1980 and 2030 levels of development

History (cont’d)

- Early ‘90’s: BPA contracted with A.G. Crook Co. to develop semi-mo’ly 1990 level modified flows for ‘29-’89

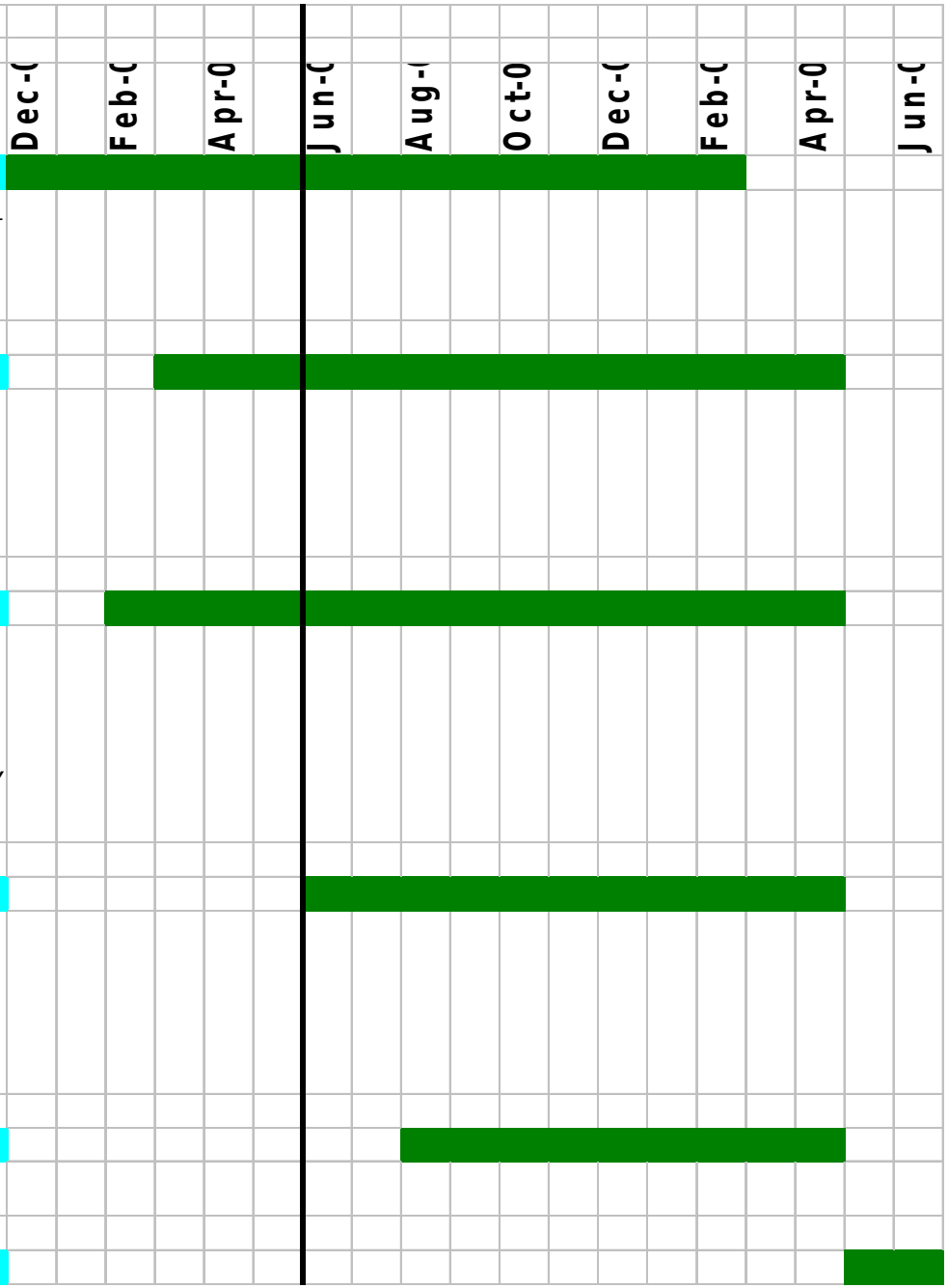
2000 Level Mod Flow Project Participants

- BPA
- BoR
- COE
- Gary Flightner (contractor)
- Art Evans (contractor)
- BC Hydro
- NRCS
- NWRFC
- PNCA parties
- USGS
- CRITFC

Funding

- Total estimated cost is about $400k
- Base costs ($230k) will be allocated amongst PNCA parties per allocation formula.
- Other costs may be paid by PNCA parties or BPA

2000 level Modified Flow Project



1. Compute adjusted flows

Objectives: compute flows on daily, weekly, monthly, semi-monthly basis for 1929-1999 period. Adjusted flows are historic observed flows that are adjusted to take out the effects of reservoir operations at site and upstream.

2. Compute modified flows

Objectives: compute 2000 level modified flows on daily, weekly, monthly, semi-monthly basis for 1929-1999 period at listed sites. Modified flows are historic observed flows that are adjusted to take out the effects of reservoir operations, then modified

3. Design database and populate.

Objectives: store all raw data (mixed daily, monthly formats); store or compute on the fly all adjusted and modified flows on a daily, weekly, semi-monthly, or monthly basis at one or more user specified sites for any time window. There will be several

4. Documentation

Objectives: reference data sources; describe all historic data estimation methodologies and historic data adjustments; describe simulation studies for calculating basin outflows (Snake, Deschutes, Yakima) and data supporting studies. Document database q

5. Review

Objectives: regional acceptance of 2000 level modified flows

6. Disseminate data and documentation

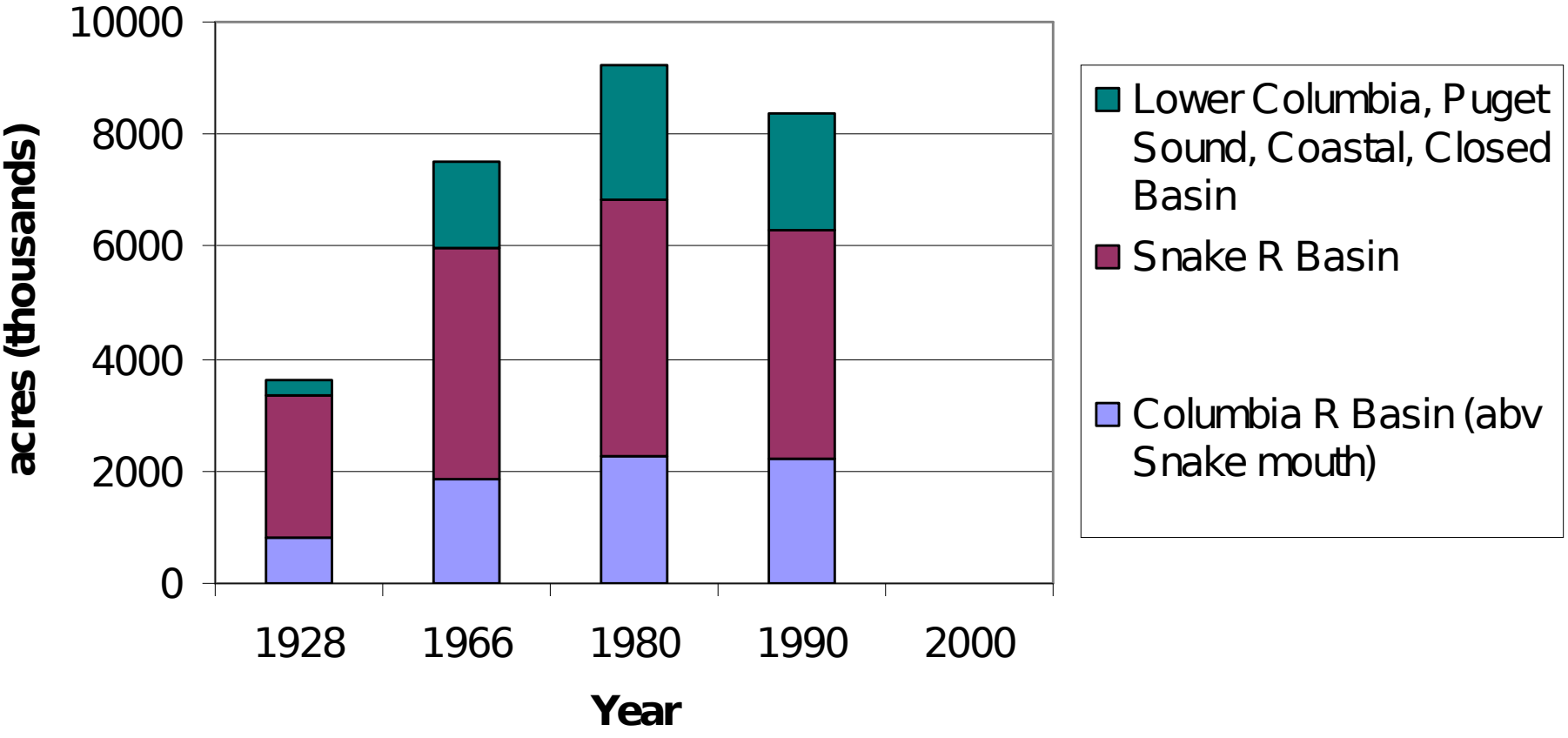
Methodology
Adjusted Flows

- Develop complete record of historic streamflows at all sites
- Route flows from headwater site downstream (method used depends on time step)

Methodology
Modified Flows

- To adjusted flows add the incremental depletions (at site and upstream) between historic year and 2000 level

Irrigated Acreage in Pacific Northwest



Irrigation Depletions How are they estimated?

- Blaney-Criddle method of estimating crop consumptive use
- Crop composition estimated from agricultural censuses
- Estimated max annual incremental depletion reduces the flow at The Dalles by <1% (1990 level study)

Irrigation Depletions How are they estimated?

Blaney-Criddle Method used for:

- Mid-Columbia
- Upper Columbia and Kootenay
- Clark Fork and Pend Oreille
- Lower Columbia
- Lower Snake

Irrigation Depletions How are they estimated?

Simulation studies produce regulated flows at basin mouth for:

- Yakima
- Deschutes
- Snake above Brownlee

Irrigation Depletions How are they estimated?

By return flow studies:

- Columbia Basin Project

Data Storage and Retrieval

Database will contain:

- Daily historic flows
- daily historic change in reservoir contents
- estimated evaporation data
- adjusted flows
- estimated depletions
- modified flows

Data Access

- All participating parties will have access to data
- Need to establish policy for distributing data base
- Need to establish policy for distributing data to others

Invitation to participate in review of 2000 level modified flow data

Any questions, comments

please contact me

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